

**PROPOSAL FOR  
VCM-BASED NO FURTHER ACTION  
ENVIRONMENTAL RESTORATION SITE 6,  
GAS CYLINDER DISPOSAL PIT (BUILDING 9966)  
OPERABLE UNIT 1335  
August 1996**

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Disposal Pit

## ACRONYMS AND ABBREVIATIONS

ac	acre(s)
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EORC	Environmental Operations Records Center
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	feet
HSWA	Hazardous and Solid Waste Amendment
in	inch(es)
KAFB	Kirtland Air Force Base
mg/kg	milligram(s) per kilogram
mi	mile(s)
MDA	minimum detectable activity
MS	matrix spike
MSD	matrix spike duplicate
NaI	sodium iodide
NFA	no further action
PID	photoionization detector
PRS	potential release site
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RPO	Radiation Protection Operations
RPOP	Radiation Protection Operations Procedure
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TOP	technical operating procedure
UXO	unexploded ordnance
VCM	voluntary corrective measure

## 1.0 INTRODUCTION

### 1.1 ER Site Identification Number and Name

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a voluntary corrective measure (VCM) based no further action (NFA) decision for Environmental Restoration (ER) Site 6, Gas Cylinder Disposal Pit (Building 9966), Operable Unit 1335. ER Site 6 was identified in the Hazardous and Solid Waste Amendment (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA August 1992).

### 1.2 SNL/NM VCM-Based NFA Process

This proposal for a determination of a VCM-based NFA decision has been prepared using the criteria presented in Annex B of the Environmental Restoration Document of Understanding (NMED November 1995). Specifically, this proposal will "contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMU) at the facility that may pose a threat to human health or the environment" (as proposed in the Code of Federal Regulations [CFR] Section 40 Part 264.51[a][2]) (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/corrective measures study process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993).

If the available archival evidence indicates a VCM is warranted, SNL/NM performs the VCM and obtains confirmatory samples to increase the weight of the evidence and allow an informed decision regarding whether to proceed with the NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The U.S. Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that

the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination. . . . The actual extent

of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987).

In requesting a VCM action and verification sampling NFA decision for ER Site 6, Gas Cylinder Disposal Pit (Building 9966), this proposal relies upon existing administrative/archival information and the results of a VCM action and verification sampling conducted in July 1995 to satisfy the permit requirements. A site is eligible for an NFA proposal if it meets one or more of the following criteria set forth in the Environmental Restoration Document of Understanding (NMED November 1995)

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.
- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents or other Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances.
- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.
- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.
- NFA Criterion 5: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Specifically, ER Site 6 is proposed for a VCM-based NFA decision because analytical results indicate the site clearly has not released hazardous waste or constituents into the environment (NFA Criterion 3).

### 1.3 Local Setting

SNL/NM occupies 2,829 acres (ac) of land owned by the U.S. Department of Energy with an additional 14,920 ac of land provided by land-use permits with Kirtland Air Force Base (KAFB), the U.S. Forest Service, the State of New Mexico, and Isleta Pueblo lands. SNL/NM has been involved in nuclear weapons research, components development, assembly, testing, and other nuclear activities since 1945.

ER Site 6 (Figure 1-1) lies on U.S. Department of Energy controlled land in the southern part of Thunder Range approximately 1 mile (mi) west of the Solar Power Facility and 550 feet (ft)



west of the west end of the large Shock Tube at ER Site 89C. The site covers approximately 1.4 ac of land at a mean elevation of 5,402 ft above sea level (SNL/NM March 1996a).

The nearest well to ER Site 6 is Chemical Waste Landfill Monitor Well 5, which is located approximately 0.5 mi north of ER Site 6. Well completion records indicate that the well was drilled in April 1994 to a total depth of 558 ft. The well was screened between 533 and 553 ft below ground surface in alluvial sediments, and depth to groundwater was 481 ft below ground surface in December 1995 (SNL/NM March 1996b).

## **2.0 HISTORY OF THE SWMU**

### **2.1 Sources of Supporting Information**

In preparation to requesting a VCM-based NFA decision for ER Site 6, SNL/NM conducted a background archival study and collected soil samples to confirm that no release of hazardous constituents occurred. Historical background information sources included existing records and reports of site activity. In addition, analytical results from confirmatory samples verify that during the site operational activity, hazardous waste or constituents clearly were not released into the environment.

The following information sources, hierarchically listed with respect to assigned validity, were available for use in evaluating ER Site 6:

- Nine soil sample analyses from excavated soil and soil from the bottom of the excavated pit
- One interview with a retired SNL/NM employee
- Miscellaneous information sources, including the SNL/NM Geographic Information System and SNL/NM personnel correspondence (memoranda, letters, and notes)
- The Comprehensive Environmental Assessment and Response Program (CEARP) Phase I report (DOE September 1987) and CEARP records contained in the SNL/NM Environmental Operations Records Center (EORC)
- The RFA report (EPA April 1987).

Using this information, a brief history of ER Site 6 and a discussion of all relevant evidence regarding past practices and releases at the site have been prepared and are presented in this proposal for a VCM-based NFA decision.

### **2.2 Previous Audits, Inspections, and Findings**

ER Site 6 was identified during investigations conducted under the CEARP (DOE September 1987) and the RFA (EPA April 1987). The CEARP stated that "in the mid- to late-1970s some gas cylinders were buried in a 6- to 8-ft pit about 3/4 mi south of Building 9966." However, this location was not confirmed by other sources. One source (Reference 439) states that the disposal pit was adjacent to Building 9964. A second source (Reference 722) states that the pit was 400 yards (approximately 1/4 mi) west-southwest of Building 9966. A third source (Reference 286) describes the pit as being 100 yards west of the Lead Firing Site (ER Site 91). This last location was verified in the field by the presence of a shallow pit at this location that appeared to have been partially backfilled. The specific contents of these cylinders were not known, but they were recalled to be poisonous by some interviewees

(DOE September 1987). The Comprehensive Environmental Response, Compensation, and Liability Act finding was positive for federal facility site discovery and identification findings, preliminary assessment, and preliminary site inspection. Planned future action for the site called for the use of geophysical techniques to collect additional information on the location of subsurface materials at the site. The SNL/NM remediation report for ER Site 6 (SNL/NM September 1995) summarizes results of the geophysical survey.

In addition to the CEARP inspection, the EPA conducted an RFA. The RFA report (EPA April 1987) notes that "used gas cylinders were piled outside and adjacent to Building 9966 in Coyote Test Field. The cylinders have since been removed. The content of the cylinders are unknown but were thought to be toxic. The number of cylinders and the size of the area in which they were placed is unknown." Dates cited in the RFA report are in agreement with the CEARP (mid- to late-1970s). The RFA report concluded that the potential for release could not be determined because of a lack of information regarding the waste managed.

### 2.3 Historical Operations

ER Site 6 (Figure 2-1) contained an approximately 30- by 30- by 6-ft-deep pit that was reportedly excavated in the early 1970s as part of the waste management and disposal activities associated with the shock tube and explosive experiments at Thunder Range (SNL/NM March 1996a). The pit at ER Site 6 was reported to have been used to destroy pressurized gas cylinders. Gas cylinders were placed in the pit and punctured by metallic charges so that the contents could escape (Reference 721). The empty cylinders were then removed from the pit for disposal. The pit at ER Site 6 was backfilled sometime in the late 1970s. There are no known records of disposal of radioactive materials at the site (SNL/NM September 1995).

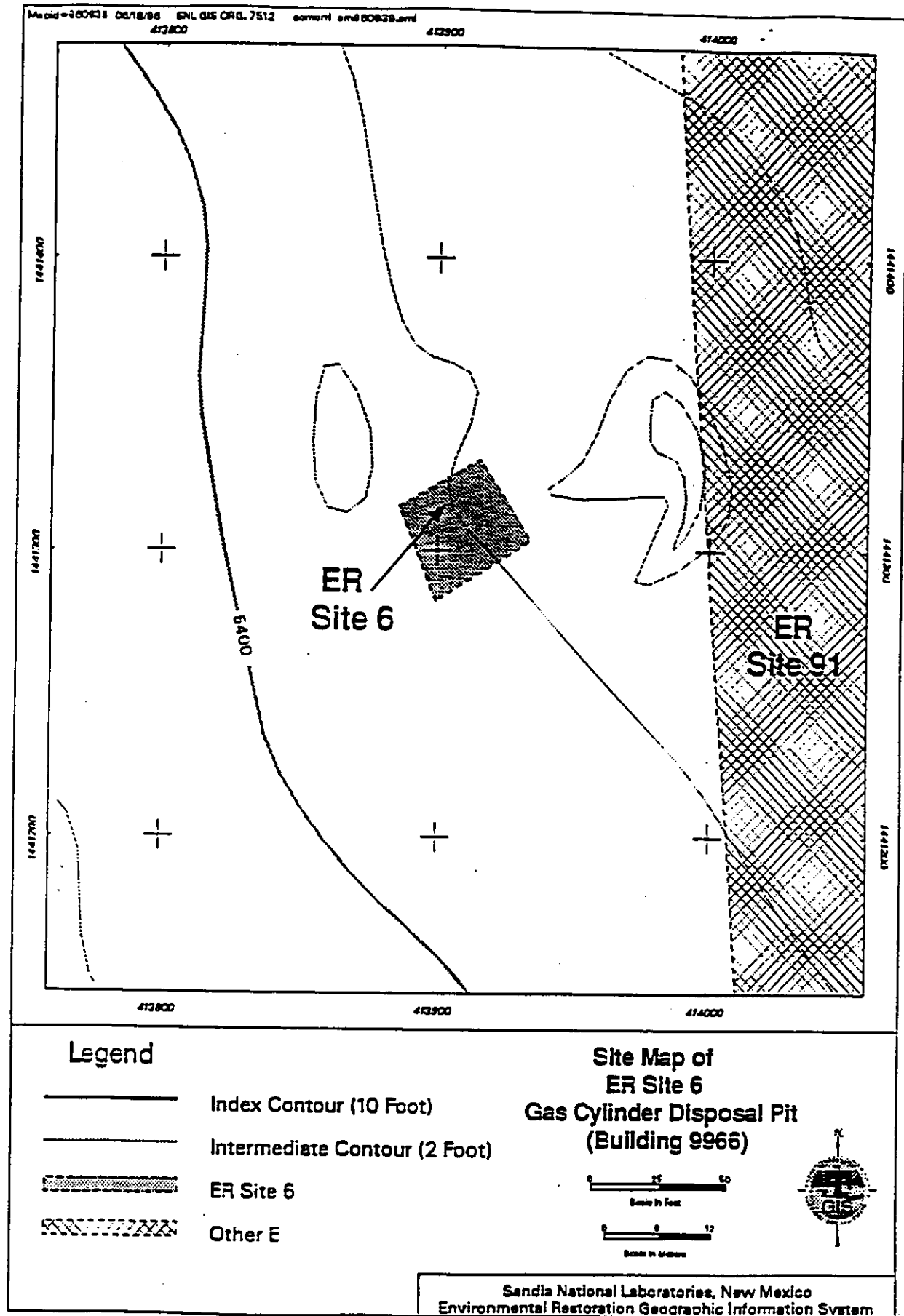


Figure 2-1

## **3.0 EVALUATION OF RELEVANT EVIDENCE**

### **3.1 Unit Characteristics**

ER Site 6 contained an excavated pit (approximately 30- by 30- by 6-ft deep) where pressurized gas cylinders were placed. The gas cylinders in the pit were punctured by metallic charges to allow the gas to escape. The empty cylinders were then allegedly removed from the pit. Since the contaminants of concern were in gaseous form, it is unlikely that residual material remains in the soil. The excavated pit was reportedly backfilled sometime in the late 1970s.

### **3.2 Operating Practices**

Cylinders placed in the pit at ER Site 6 were punctured with metallic charges and then removed from the pit and taken to ER Site 6A for disposal.

### **3.3 Presence or Absence of Visual Evidence**

The former pit at ER Site 6 was delineated by a shallow depression approximately 20- by 25-ft with side walls approximately 18 inches (in.) deep. No surface debris was identified prior to excavation of the pit during the VCM action (SNL/NM September 1995).

### **3.4 Results of Previous Sampling/Surveys**

#### **3.4.1 Surface-Soil Sampling**

In March 1995, SNL/NM collected six surface-soil samples from ER Site 6 and adjacent areas to the south to determine the possible extent of lead contamination from the adjacent Lead Firing Site (ER Site 91). A control sample was also collected from the Lead Firing Site. The samples were submitted to SNL/NM Department 7584 for metals analysis by X-ray fluorescence spectroscopy. Hazardous metal concentrations are below SNL/NM background levels for all samples except ER Site 91 control sample 1335-06-6 and its duplicate, which have measured lead values of 299 and 292 milligrams per kilogram (mg/kg), respectively (Kottenstette March 1995). None of the ER Site 6 samples exceeded the background upper tolerance limit for lead of 68 mg/kg (IT March 1996a).

#### **3.4.2 Unexploded Ordnance/High Explosives Survey**

In November 1993 and February 1995 an unexploded ordnance (UXO) visual surface survey was performed by KAFB Explosive Ordnance Disposal personnel at ER Site 6. No UXO or

ordnance debris was found anywhere on the site or in the site's buffer zone that extends 100 ft from the pit on three sides and 200 ft from the pit on the south side.

### **3.4.3      Gamma Radiation Survey**

On October 26, 1994, personnel from the SNL/NM Radiation Protection Operations (RPO) performed a gamma radiation survey of the pit at ER Site 6, and on February 27, 1995, RPO performed a survey of the approximately 200- by 300-ft area surrounding the pit (Oldewage March 1995). Both gamma surveys utilized a 2- by 2-in. sodium-iodide (NaI) detector with the alarm set at 1.3 times the mean area background, in accordance with RPO Procedure (RPOP)-08-810. No readings were identified above the alarm setpoint in either survey.

### **3.5      Assessment of Gaps in Information**

There is no definitive record stating the presence or absence of hazardous materials in the cylinders that were destroyed in the pit at ER Site 6.

### **3.6      VCM Action and Results of Verification Sampling**

The remediation of ER Site 6 was based on the assumption that unruptured gas cylinders existed in pits that could either leak or rupture (SNL/NM September 1995). The goal of the remediation was to remove these cylinders so that a potential risk to human health and the environment could be eliminated (Figure 3-1A). The remediation process for ER Site 6 was performed in five phases: a non-intrusive geophysical investigation and assessment to verify the presence or absence of buried metal cylinders; excavation and removal of the contents of the pit (Figure 3-1B); removal of any unruptured gas cylinders that may be present and the characterization of their contents (none found); waste management of recovered gas from unruptured cylinders (not required); waste management of the recovered soil in the pits (not required) (Figure 3-1C).

The geophysical investigation identified 13 anomalies with a magnetometer, which triggered the VCM action. Excavation of the pit revealed debris and scrap metal (cable, wire, etc.) as the only metal objects found. No gas cylinders, debris from gas cylinders, or other hazardous materials were found in the pit (SNL/NM September 1995).

During pit remediation activities at ER Site 6, three composite samples were collected from staged soils, five samples were collected from the bottom of the excavated pit, and one sample was collected for determining background. Samples were analyzed by gamma spectroscopy for radionuclides, by EPA Method SW 8270 for semivolatile organic compounds (SVOC), by EPA Method SW 6010/7000 for metals, and by alpha spectroscopy for isotopic thorium, uranium, and plutonium. Field screening for organic vapors, high explosives, polychlorinated biphenyls, and radionuclides was performed at the sampling locations during the sampling activities. Field screening activities were performed to facilitate the segregation



Figure 3-1A. Site 6 Gas Cylinder Disposal Pit  
Before Excavation Activities

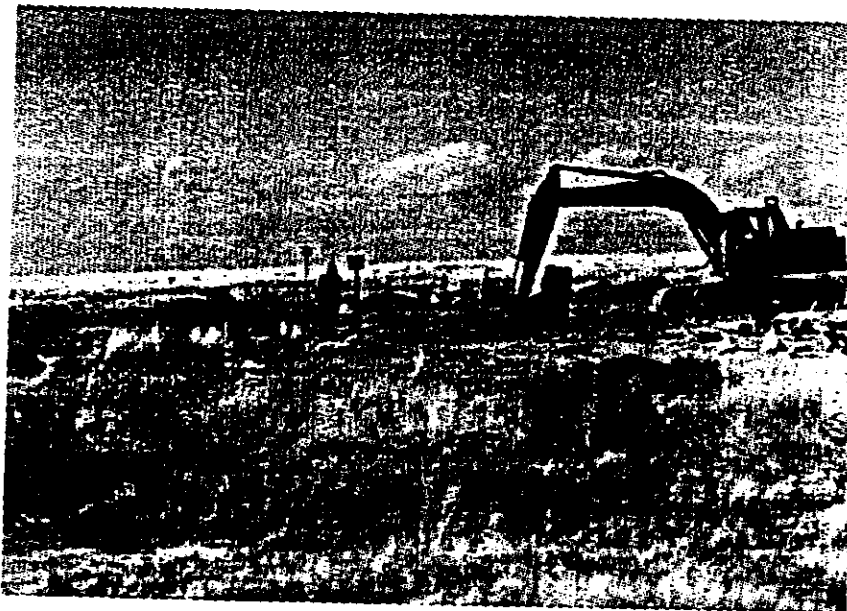


Figure 3-1B. Site 6 Gas Cylinder Disposal Pit  
Excavation Activities

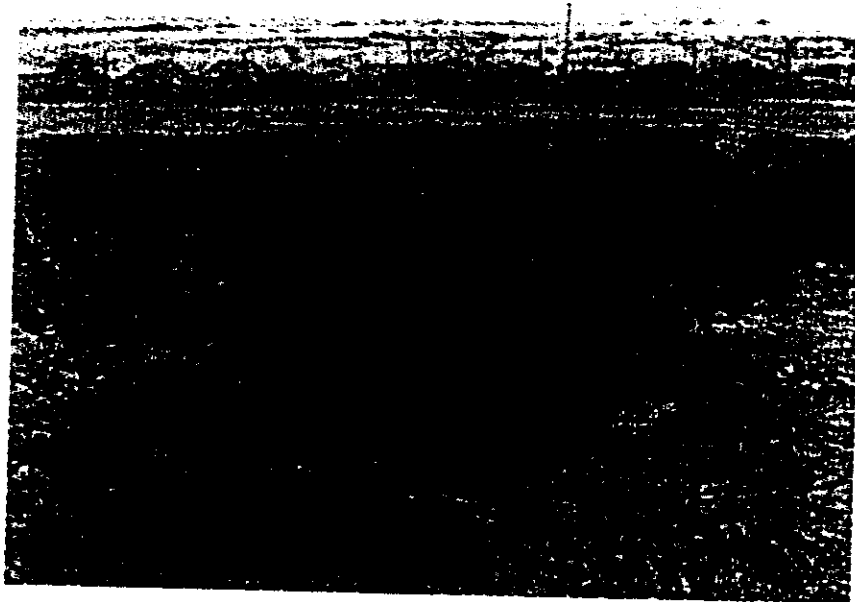


Figure 3-1C. Site 6 Gas Cylinder Disposal Pit  
Completed Excavation

of soils from the pits. The sampling and analysis plan (Appendix A) provides details on the sampling event.

### 3.6.1 Field Screening

During soil sampling activities at ER Site 6, field-screening measurements were taken of all soil sampling horizons. The field screening was conducted in accordance with the methodologies prescribed in the sampling and analysis plan (Appendix A) and was performed with a photoionization detector (PID) for organic vapors and a Geiger-Muller beta/gamma probe (Eberline Model ASP-1/HP-260), an alpha probe (Eberline Model ASP-1/AC-3), and a gamma scintillometer (Eberline ESP-2/NaI) for radionuclides. Organic vapors detected by the PID during sampling activities never exceeded the action level of 5 parts per million above background that would warrant an upgrade to health and safety Level C attire. No real-time radiation readings were identified above 1.5 times the mean background activity (SNL/NM September 1995). Additionally, field screening indicated high explosives and polychlorinated biphenyls were absent in the soil and these constituents were not considered in further soil-sampling activities.

### 3.6.2 Laboratory Analysis Results for Soil Samples

The analytical data package for ER Site 6 soil samples is available and can be viewed in the SNL/NM EORC. Quanterra Environmental Services in Denver, Colorado analyzed the soil samples for SVOCs and metals. Isotopic thorium, uranium, and plutonium analyses were performed at Lockheed Analytical Services located in Las Vegas, Nevada. Gamma spectroscopy was performed by SNL/NM RPO, Organization 7714.

Soil samples were analyzed for SVOCs using EPA Method 8270 (EPA November 1986). All SVOC results were below analytical detection limits, and the analytical results and quality assurance (QA)/quality control (QC) documentation can be reviewed in the SNL/NM EORC.

Table 3-1 presents the analytical results for metals. Soil samples were analyzed for metals using EPA Method 6010/7000 series (mercury by EPA Method 7471) (EPA November 1986). Cadmium, mercury, selenium, and silver were not detected in any of the samples at the laboratory reporting limit. Arsenic, barium, beryllium, chromium, and lead were detected in levels exceeding the laboratory reporting limit, but all detections fall within the following SNL/NM reported background ranges (Table 3-1).

Table 3-2 summarizes analytical results for isotopic thorium, uranium, and plutonium as measured by alpha spectrometry. Results for thorium and uranium agree with activities reported for thorium and uranium isotopes in background soil samples from SNL/NM (IT March 1996). Thorium-232 activity (1.21 pCi/g) is 0.03 pCi/g above background at the Southwest Test Area (IT March 1996). However, this activity is within the range of background values for the North Area (0.533 to 2.14 pCi/g) (IT March 1996). This slight variation is considered to be insignificant. Anthropogenic fallout activities for plutonium isotopes were not established at SNL/NM because most analytical results for plutonium were

**Table 3-1**  
**Summary of Metals Results for ER Site 6 Soil Samples**

Sample Location: ER Sample ID: LAL Sample No: Sample Type: Sample Depth: Sample Date:		Site 6 East Soil Pile 022379-03 041753-0001 On-site Composite 04/19/95	Site 6 West Soil Pile 022380-03 041753-0002 On-site Composite 04/19/95	Site 6 NE Corner Pit 6 022382-03 041700-0001 On-site 2 feet 04/20/95	Site 6 NW Corner Pit 6 022383-03 041700-0002 On-site 4 feet 04/20/95	Site 6 SE Corner Pit 6 022384-03 041700-0003 On-site 2 feet 04/20/95
	LAL (mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Metals <sup>a</sup>						
Arsenic	1.0	3.6	3.6	5.7	4.7	4.2
Barium	1.0	166	156	145	141	131
Beryllium	0.2	0.73	0.69	0.69	0.69	0.65
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	1.0	11.0	8.8	9.1	7.9	8.0
Lead	5.0	32.9	14.0	14.5	12.4	12.0
Mercury	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Selenium	0.55	<0.55	<0.55	<0.55	<0.55	<0.55
Silver	1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Sample Location: ER Sample ID: LAL Sample No: Sample Type: Sample Depth: Sample Date:	Site 6 SW Corner Pit 6 022385-03 041700-0004 On-site 5 feet 04/20/95	Site 6 Center Bottom 022386-03 041700-0005 On-site 9 feet 04/20/95	Site 6 Background 022387-03 041700-0006 On-site 1 foot 04/20/95	Site 6 E/W Soil Pile 022388-03 041700-0007 On-site Composite 04/20/95	Background Concentration Range (Subsurface) <sup>b</sup>
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Metals <sup>a</sup>					
Arsenic	5.3	3.5	4.3	4.5	0.033 - 17.0
Barium	147	131	125	155	0.5 - 495
Beryllium	0.68	0.38	0.65	0.64	0.1 - 1.6
Cadmium	<0.5	<0.5	<0.5	<0.5	0.003 - 6.2
Chromium	9.7	4.9	7.8	9.0	0.5 - 31.4
Lead	14.9	6.1	11.8	10.2	0.75 - 103
Mercury	<0.1	<0.1	<0.1	<0.1	0.001 - 0.68
Selenium	<0.55	<0.55	<0.55	<0.55	0.037 - 17.2
Silver	<1.0	<1.0	<1.0	<1.0	0.0016 - 8.7

<sup>a</sup>Metals analyzed by EPA Method 6010/7000 series (mercury analyzed by EPA Method 7471) (EPA November 1986).  
<sup>b</sup>IT March 1996

mg/kg = milligrams per kilogram  
LAL = laboratory reporting limit

Table 3-2  
Summary of Radionuclide Results for ER Site 6 Soil Sample

Sample Location: Site 6 West Soil Pile ER Sample ID: 022380-04 LAL Sample No: L4345-1 Sample Type: On-site Sample Depth: Composite Sample Date: 04/19/95				
	Activity (pCi/g)	Error (pCi/g)	MDA (pCi/g)	Background Range (Subsurface) <sup>a</sup> (pCi/g)
Plutonium-238	0.0032	0.0076	0.0045	NA
Plutonium-239/240	0.0175	0.010	0.0037	NA
Thorium-228	1.15	0.17	0.065	NA
Thorium-230	1.19	0.15	0.073	NA
Thorium-232	1.21	0.15	0.030	0.113 - 1.18
Uranium-233/234	0.785	0.10	0.023	0.44 - <5.02
Uranium-235	0.052	0.024	0.0095	0.004 - 3.0
Uranium-238	0.84	0.11	0.015	0.153 - 2.3

<sup>a</sup>IT March 1996

pCi/g = picocuries per gram

MDA = minimum detectable activity

below the minimum detectable activity (MDA). Table 3-2 indicates that plutonium-238 is below the MDA and plutonium-239/240 was detected above the MDA. The reported plutonium-239/240 activity is in agreement with fallout activities reported for some background soil samples (IT March 1996).

Gamma spectroscopy results obtained from SNL/NM RPO show that all detectable gamma radiation is associated with progeny in the decay chains of naturally occurring uranium-238 and thorium-232 (SNL/NM September 1995).

### **3.6.3 QC Summary**

Field and laboratory QC samples were not collected for the soil sample results reported in Tables 3-1 and 3-2. However, QC samples for ER Site 6A show that chemical analyses were performed in accordance with the SNL/NM EORC "Verification and Validation of Chemical and Radiochemical Data" Revision 0 (TOP [Technical Operating Procedure] 94-03) (SNL/NM July 1994). Additionally, field blanks, duplicates, matrix spike (MS) and matrix spike duplicate (MSD) results for ER Site 6A indicate that project samples were not cross-contaminated by the sampling equipment or containers and the MS/MSD and laboratory control/laboratory control duplicate were within the acceptance limits established for percent recovery and relative percent difference.

### **3.6.4 Nonconformances/Variations to Sampling and Analysis Plan**

A nonconformance is an unplanned and unintended deviation from the established sampling and analysis plan or procedures. At ER Site 6, duplicate and MS/MSD samples were not identified on the chain of custody form. Therefore, there is a nonconformance associated with the absence of laboratory QA/QC data on the soil samples collected for SVOC and metals analysis. A variance is an approved and controlled change to the established sampling and analysis plan or procedures. There were no variance issues associated with the sampling at ER Site 6.

## **3.7 Rationale for Pursuing a Confirmatory Sampling NFA Decision**

SNL/NM is proposing a VCM-based NFA decision for ER Site 6 because no release to the environment has occurred, nor is likely to occur in the future (NFA Criterion 3).

ER Site 6 contained an approximately 30- by 30- by 6-ft-deep pit that was reportedly excavated in the early 1970s as part of the waste management and disposal activities associated with the shock tube and explosive experiments at Thunder Range (SNL/NM March 1996). The pit at ER Site 6 was reported to have been used to destroy pressurized gas cylinders. Gas cylinders were placed in the pit and punctured by metallic charges to let the contents escape (Reference 721). Cylinders were reportedly removed from the pit and moved to ER Site 6A for disposal. The pit at ER Site 6 was filled with clean burrow pit soil sometime in the late 1970s. There are no known records of disposal of radioactive materials at the site (SNL/NM September 1995).

Confirmatory sampling and analysis of soils below the gas cylinder disposal pit floor horizon indicate that detected levels of arsenic, barium, beryllium, chromium, and lead are within the range of background values for SNL/NM and KAFB. No other hazardous metals or materials were detected in the soil samples.

Therefore, based on archival information and analytical results from the VCM action, ER Site 6 is recommended for a VCM-based NFA decision because no release to the environment has occurred, nor is likely to occur in the future (NFA Criterion 3).

## 4.0 CONCLUSION

Based upon the evidence cited above, no potential remains for a release of hazardous waste (including hazardous constituents) that may pose a threat to human health or the environment. Therefore, ER Site 6 is recommended for a VCM-based NFA determination based on NFA Criterion 3: no release to the environment has occurred, nor is likely to occur in the future.

## 5.0 REFERENCES

### 5.1 ER Site References

Reference 439. Sandia National Laboratories/New Mexico, June 24, 1985, Environmental Operations Record Center Record Number ER/7585/1335/6/REP/85..

Reference 721\*. Sandia National Laboratories/New Mexico, August 1994, Environmental Operations Record Center Record Number ER/7585/1335/6/FOR/94-721.

Reference 722. Sandia National Laboratories/New Mexico, August 1994, Environmental Operations Record Center Record Number ER/7585/1335/6/FOR/93.

Kottenstette, R.J. Memorandum to S. Wrightson, Sandia National Laboratories, Albuquerque, New Mexico, March 15, 1995.

Oldewage, H. Memorandum to S. Wrightson, Sandia National Laboratories, Albuquerque, New Mexico, March 1, 1995.

### 5.2 Reference Documents

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

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**APPENDIX A**

**Voluntary Corrective Measure Plan  
Investigation and Excavation of Environmental  
Restoration Site 6, Gas Cylinder Disposal Pit**

Fincl. to EPA 3/24/

ER/7585/1335/6/VCM/REP/95

**VOLUNTARY CORRECTIVE MEASURE PLAN**

**INVESTIGATION AND EXCAVATION  
OF  
ENVIRONMENTAL RESTORATION SITE #6  
GAS CYLINDER DISPOSAL PIT**

**SNL ENVIRONMENTAL RESTORATION PROJECT  
February 1995**

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## 1.0 Introduction

### 1.1 Site Description

This VCM covers the investigation and complete excavation of the Site 6 Gas Cylinder Disposal Pit, located at the SNL/NM facility in Bernalillo County, New Mexico. The facility is adjacent to, and immediately southeast of the City of Albuquerque. SNL/NM is situated within the external boundaries of the Kirtland Air Force Base (KAFB). The pit is located on DOE controlled land in South Thunder Range, approximately one mile from the Solar Power Facility and approximately 550 ft. west of the west end of the large Shock Tube at ER site 89. (See Figure 1.)

For a period of approximately 2 months in the 1970s, gas cylinders of unknown origin and contents were deposited in the approximately 30 X 30 X 6 feet deep pit and intentionally ruptured to release their contents. The bottles have reportedly since been removed and the pit partially backfilled. A recent magnetic survey of the site identified 13 anomalous areas, which may or may not be related to the gas cylinders. If intact cylinders are identified during the excavation, their contents will be characterized and then properly disposed. Surrounding soils will be tested during the course of the excavation.

### 1.2 Previous Studies

#### Background Investigation:

Information available about this site is primarily process knowledge of past activities obtained from interviews with employees who had knowledge of those activities. This information indicated that the pit had a very short usage for treatment / disposal of gas cylinders, and that all cylinders were removed after that time. Although the materials contained in the gas cylinders are unknown, interviewees state that no radioactive materials were deposited in the pit.

#### Unexploded Ordnance Survey

Site 6 was surface surveyed for the presence of unexploded ordnance, (UXO), in November 1993 and again in February 1995. No UXO or ordnance debris was found anywhere on the site or in a buffer zone extending 100 ft. from the pit on all sides, and 200 ft. on the south side. Consultation with KAFB Explosive Ordnance Disposal (EOD) indicates that the Thunder Range area was not heavily used in the past for ordnance-producing activities. All sites within this area have been surveyed and were found to be clear of UXO and ordnance debris.

#### Magnetometer Survey:

Based on this process knowledge, a screening magnetometer survey of the pit area at site 6 was conducted by WESTON on October 6, 1994 to verify that all the gas cylinders had actually been removed from the site. Screening was performed by sweeping the pit with an approximate 6-ft. swath with both the fluxgate magnetometer (Foerster FEREX) and all-metal detection (White) instruments. A grid was established with the origin

at the southwest corner post of the pit boundary. (See Figure 2)

The FEREX is designed for detection of ferrous unexploded ordnance at various depths. A small steel cylinder the size of a lecture bottle can be detected to a depth of approximately 4 to 5 ft. The detection is dependent upon the size and orientation of the subsurface steel object. The FEREX is an analog system in which the operator notes the deflection of the instrument gauge needle and listens for changes in tones to locate the ferromagnetic object. The location and depth of an object can be estimated by noting the location of the inflection points on the instrument gauge.

The White all-metal detector is designed for the detection of metal coins at depths of 0 to 6 ins. from the surface. This maximum depth generally holds for objects the size of small cylinders. The White is also an analog system in which the operator listens to a tone and notes the ground location of the highest pitched tone to locate the target. Depth estimates cannot be made with this instrument.

A total of 13 anomalies were detected with the FEREX magnetometer. (See Figure 2) The group of five anomalies at grid location 15 ft. north and 25 ft. east were not easily distinguishable and may be interpreted as a mass of target(s). The actual size and magnitude of each anomaly were not quantitatively measured and any estimates as to the size of the buried material could not be made. The lack of response of the White all-metal detector indicates that the depths of the magnetic anomalies are greater than 6 in. from the surface.

#### Radiation Surveys:

On October 26, 1994, SNL Radiation Protection Operations (RPO) personnel performed a survey of the Gas Cylinder Disposal Pit (ER Site 6) in Thunder Range. On February 27, 1995, RPO performed a survey of the area surrounding the pit (approximately 200 by 300 ft.) Both surveys utilized a 2X2 inch NaI detector, scanning at a rate of approximately 1-2 ft/sec, with the instrument alarm set at 1.5 times the mean area background, in accordance with SNL RPOP-08-810. No readings were identified above the alarm setpoint in either survey.

The 10/26 survey of the pit also included use of a G-M pancake probe. Two slightly elevated readings (but still below 1.5 times background) were obtained inside the pit with the NaI detector. These two points were <20 cpm above background with the pancake probe. This is within the normal realm of background fluctuation for that detector, and is of no concern.

Gamma spectroscopy analysis was performed on a soil sample collected at the highest of these two points. Only naturally occurring radionuclides were identified from this analysis. (See RPO Report - attachment 4)

### 1.3 VCM Objective

The objective of the VCM is to investigate and evacuate the magnetic anomalies and soil in the Gas Cylinder Disposal Pit, in order to make a determination as to its hazardous or non-hazardous nature. If pit contents are found to be non-hazardous, based on soil analytical results obtained during the VCM, the site may be proposed for No Further Action. If hazardous materials or contamination is found, the excavated material will be properly disposed of, thus eliminating potential off-site migration. The site may then be proposed for clean closure pending confirmatory sampling results.

#### 1.4 VCM and Temporary Authorization Justifications

Temporary Authorization to proceed with the proposed VCM is necessary to reduce potential impacts to human health, including site workers and visitors, and the environment. Implementing the VCM now is also critical to minimize potential off-site migration and will result in a more efficient and complete clean up. Since records indicate the gas cylinders have been previously removed, this investigation would allow verification of this information and potential initiation of a No Further Action Status of the site eliminating the need to implement a separate costly and time consuming site characterization. If intact gas cylinders are present, the VCM will accelerate mitigation of a site which has the potential of presenting immediate hazards to human health and the environment.

#### 1.5 Cleanup Levels

The corrective action objectives include removing contamination to levels that will allow unrestricted use of the potentially contaminated site. Verification soil sampling results of the excavated pit will be evaluated in order to make this determination. This proposed VCM is consistent with this overall objective and with the corresponding permit requirements, as well as the requirements of proposed Subpart S, in that this removal action will not preclude any other corrective action deemed necessary in the future.

#### 1.6 Statutes and Regulations

The statutes and regulations that govern compliance at these sites are the following:

- RCRA, as amended, 42 U.S.C. 6901 et seq.;
- Clean Air Act;
- Occupational Safety and Health (OSHA);
- National Historic Preservation Act;
- National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 et seq.;
- Parallel or related State of New Mexico requirements;
- Albuquerque/ Bernalillo County requirements;
- Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq.;

#### 2.0 Removal Action

The objective of the VCM is to investigate and evacuate the contents of the Gas Cylinder Disposal Pit. The procedure during the excavation will be to remove, examine and segregate the entire contents of the Site 6 Gas Cylinder Disposal Pit, and analyze contents of any gas cylinders found to be intact. The complete excavation will be conducted according to an approved Health and Safety Plan. The pit will be backfilled after all debris and solid materials have been removed. Site-specific changes to this procedure shall be documented on field logs and data tracking forms.

Investigation of the site has commenced with the UXO, magnetometer, and radiation surveys at the site. The excavation will begin once mobilization is complete and all support areas are in place, including trailers for an office, small tools and materials storage, decontamination, and to house air monitoring equipment. Site preparation includes the construction of soil and debris stockpiling areas, surrounded by soil berms and lined with HDPE liner material. Access control and appropriate work zones (support,

reduction, and exclusion) will be delineated for the execution of site activities. Temporary fencing, construction barricades, and hazard tape will be erected to limit site access to authorized personnel. During site preparation, the suspected locations of buried gas cylinders (based on magnetometer survey results) will be flagged on the surface of the disposal pit.

The excavation will be accomplished using equipment which does not enter the pit, but rather is stationed at the pit edge, and can reach into the pit area. A technician will be used as a spotter to guide the excavator operator in locating and avoiding cylinders and unknown hazards while carefully excavating soil and debris from the pit. Removal of the pit contents will proceed from this location until all material has been removed to the maximum reach of the excavator. Soils will be removed in sequential lifts of approximately 0.5 to 1 ft. The pit surface will be scanned for radioactivity and magnetic anomalies between each subsequent layer. This process will continue until the depth of the pit is reached where native soil is encountered, anticipated to be approximately 6 to 8 ft. from ground surface.

Material that has been excavated will be sorted for the existence of pieces of debris. Throughout the excavation activity, large pieces of metal debris (possibly pieces of cylinders) will be removed either by the excavator or by hand and placed into a separate pile from other excavated material. At locations where gas cylinders are suspected to be buried or whenever other hazards are encountered, excavation with mechanical equipment will cease within 2 ft. of the hazard. Specialized removal operations, as described below, will then be conducted. Any debris separated by sorting (glass shards, smaller sized metal debris, and shrapnel) will be treated as hazardous until proven otherwise, and stored in a container on site. The sorted (and presumably clean) soils will be transported to the soil stockpile area for storage. When stained, discolored or otherwise suspect soil is encountered during the excavation, it will be piled separately from non-suspect soil and sent to a segregated soil pile for sampling and analysis and special handling.

Once a cylinder or reactive chemical has been identified, the ETSC-WESTON Team cylinder chemists, wearing Level A or modified Level B personal protective equipment, (PPE), will uncover and exhume the container using archaeological tools. During the exhumation, preliminary evaluation information may become available. The cylinder chemists can gain information on potential cylinder contents by observing the Compressed Gas Association (CGA) valve configuration, ultrasonic wall-thickness measurements, or other indicators that may allow them to don a lower form of PPE. The exhumation exclusion zone will be continuously monitored for leakage and fugitive emissions.

Excavation in the disposal pit will be complete upon encountering the bottom or sidewalls of the original pit. These boundaries will be determined by observing changes in soil color, texture and density, or via increased resistance to excavation experienced by the equipment operator. These physical characteristics generally indicate undisturbed soil, thus an excavation boundary. Several confirmatory soil samples, described below in the soil sampling section, will be taken from the bottom of the pit once excavation is complete.

Once it has been determined that the insitu soil is not contaminated, the pit will be backfilled with the uncontaminated stockpiled soil in loose 8-inch lifts and compacted with the wheel and tracks of the earthmoving equipment. Clean offsite borrow material may be

required to backfill the pit. Backfilling in lifts will continue until the pit is filled to the level of the surrounding ground surface.

#### Schedule and Budget:

The VCM schedule begins in late March 1995, and should be completed within two months, but may run until August 1995 if more anomalies than expected are uncovered. Actual excavation of the pit should take no more than 2 weeks, gas cylinders evaluation and analysis should take no more than 2 weeks, and management of the cylinders should take no more than 2 weeks. Total budget is \$316,000.

### 3.0 Sampling and Analysis

The gas cylinders originally placed in the pit were pressurized containers which then were intentionally ruptured so that the gases could escape. The quantity of gas in a cylinder would not have been very great, since presumably this was a disposal of "spent" cylinders. During this "treatment", the cylinders would have been on the soil surface, and thus the released gas would have dissipated into the air. (This is especially true given the typically windy conditions at the site, and the shallowness of the pit.) There is thus scant possibility that any residues would have been deposited on the soils.

Sampling and analysis of each type of material possibly contained in the pit is explained in detail below. Pit contents may include 1) intact gas cylinders, 2) gas cylinder pieces and other debris collected from screening, 3) stained, discolored, or otherwise suspect soils encountered during excavation, and 4) soils passing through sieve equipment. Confirmatory sampling of the soils below the pit is also detailed below.

#### 1) Intact gas cylinder evaluation and analysis:

Once an intact cylinder has been completely exhumed, the remainder of the evaluation can be performed. The cylinder will be moved to a staging facility and detailed inspection of all markings, labels, and valve configurations will be performed to determine if these indicators can allow identification of cylinder contents. Some of this information could lead the evaluators to suspect that a particular cylinder may have been filled with a compound which it was not designed to contain, or that it may have been fitted with a valve that is incompatible with the cylinder body. Both scenarios are commonly encountered at research sites. When the evaluation has been completed, each cylinder will be tagged with a Field Identification Number for tracking to its final disposition. All ETSC gas cylinder evaluation protocols are in accordance with the U.S. Department of Transportation (DOT) and CGA regulations and guidelines.

The cylinder chemists will characterize the contents of unknown cylinders utilizing a specially engineered sampling unit. This unit will draw a representative sample via a vacuum manifold into a DOT 3E-1800 sample vessel for shipment to the ETSC laboratory. Lecture-sized gas cylinders, if in DOT-transportable condition, will be shipped as separate samples to the ETSC laboratory for characterization, per DOT exemption. Thorough evaluation will reveal if a gas cylinder is in proper DOT condition. Cylinders that do not meet DOT requirements will have contents transferred to ETSC containers for approved offsite recycling or disposal. The cylinders include those with inoperable valves, with compromised structural integrity, or that have been improperly configured/reconfigured for

research. An inoperable valve may be repaired or replaced by ETSC technicians to avoid the necessity of using more costly access technologies. If the cylinder cannot be repaired and contents of a cylinder cannot be transferred, ETSC will have the ability to flare or otherwise chemically treat the contents of the cylinder onsite.

The evaluation for reactive materials that may be present in the pit debris will include the inspection and recording of all labels and visible markings on the container, and a white light inspection to identify picrate or peroxide crystal formation. If a reactive material is preliminarily identified, the ETSC-WESTON Team will use remote-access equipment and will confirm the presence of, and try to characterize the material. Should the presence of an unstable compound be confirmed, the contents of the containers will be chemically stabilized according to the hazard.

#### 2) Gas Cylinder Fragments and other debris collected from sorting:

This material will be treated as hazardous until proven otherwise. Characterization and management of this material will be conducted as detailed in the waste management plan for this project. Excavation should not generate great quantities of this material. The material will not be returned to the pit, but will probably be disposed of as "industrial" waste unless proven hazardous.

#### 3) Stained, discolored, or otherwise suspect soils encountered during excavation:

For suspect soils, grab samples will be collected from the exposed face of the pit during excavation; one duplicate sample will be collected. This sampling effort is designed to provide SNL/NM with preliminary characterization data. Soils will be field screened for radioactivity and VOCs. Analysis of the suspect soils will include VOCs (EPA Method 8240), only if indicated by field screening, SVOCs (EPA Method 8270) and Target Analyte List Metals (EPA Methods 6010 and 7000 series). If the suspect soils prove to be contaminated, they will be sampled for Toxicity Characteristic Leaching Procedure (TCLP), and any other analyses required for waste management purposes.

#### 4) Soils passing through sort process:

The total volume of soil expected to be excavated from the pit is estimated to be 200 cu yds. Soils will be brought to the stockpile area by a wheel loader. A grab sample will be collected from each bucket of soil prior to its placement on the pile. The grab sample will consist of up to five aliquots of material collected from random locations in the bucket. These grab samples will be combined to form three composite samples representing the soil contained in the stockpile. Thus, 20 grab samples could comprise each composite sample from the 200 cu yd. pile of soil. The three composite samples, one duplicate, and one matrix spike will be generated and submitted for analysis. These will be analyzed for VOCs (EPA Method 8240), only if indicated by field screening, SVOCs (EPA Method 8270) and Target Analyte List Metals (EPA Methods 6010 and 7000 series). If the soils prove to be contaminated, they will be sampled for Toxicity Characteristic Leaching Procedure (TCLP), and any other analyses required for waste management purposes.

#### 5) Confirmatory sampling of the soils below the pit

Once the native soils at the bottom of the pit have been encountered, excavation will stop. One soil sample will be taken from near each corner of the pit, and one from the center of the pit floor. Soils will be field screened for radioactivity and VOCs. Analysis of the suspect soils will include VOCs (EPA Method 8240), only if indicated by field screening, SVOCs (EPA Method 8270) and Target Analyte List Metals (EPA Methods 6010 and 7000 series).

#### **4.0 Material Disposition**

##### **4.1 Waste Management**

This VCM is expected to possibly generate two types of waste streams: intact gas cylinders or cylinder fragments, and contaminated soils. No free liquids will be generated. Intact gas cylinders will be sampled and treated on site, or sent for offsite analysis if feasible. Soils removed from the pit will remain on site and be covered with plastic sheeting until sampling analytical results determine its hazardous or non-hazardous nature. Fragments and other debris will be containerized on site and characterized as to their hazardous or non-hazardous nature.

All generated waste will be handled and disposed of in accordance with SNL/NM policies. A Waste Management Plan will be generated for this VCM with input and approval from the appropriate SNL waste management personnel (Org. 7572). This plan will describe/define types and quantities of waste streams, appropriate waste containers, waste storage area(s), handling and transportation requirements, characterization requirements, and waste disposal and minimization practices.

##### **4.2 Waste minimization**

Waste minimization is incorporated into the soil screening process since it will allow potentially clean soils to be segregated and handled independently from potentially hazardous fragments and debris. Segregation of suspect soils during the excavation process will also minimize the amount of soil that may erroneously be classified as hazardous. Non-hazardous characterization of the piles of soils that are anticipated to be clean will allow their use as backfill, thus minimizing the amount that must be treated as waste.

#### **5.0 Analysis of EPA Screening Criteria**

##### **5.1 Benefits of the Proposed VCM**

Approval to proceed with the proposed VCM is necessary to reduce potential impacts to human health, including site workers and visitors, and the environment. Implementing the VCM now is also critical to minimize potential off-site migration and will result in a more efficient and complete clean up. Since records indicate the gas cylinders have been previously removed, this investigation would allow verification of this information and potential initiation of a No Further Action status of the site eliminating the need to implement costly and time consuming site characterization. However, if intact gas cylinders are present, the objective of the remediation is to accelerate mitigation of a site

which has the potential of presenting immediate hazards to human health and the environment.

The proposed VCM will reduce potential impacts to human health and the environment by minimizing possible exposure of site workers and other Kirtland AFB tenants to possible hazards associated with the site. This VCM will minimize the possibility of off-site migration. It will also result in the removal of surface contamination sources which may, if left onsite, impact surface and groundwater.

This VCM will significantly reduce costs and compress the cleanup schedule. Implementing this VCM now will avoid the cost of re-contracting and re-mobilizing personnel and equipment to KAFB. The characterization schedule will also be compressed since characterization will in essence be accomplished concurrently with the remediation.

## **5.2 Actions that will be Taken to Prevent Unacceptable Risks to Human Health and the Environment**

ER Site 6, the Gas Cylinder Disposal Pit, is located in a restricted open area where no current activity is taking place. The site is, however, adjacent to ER site 91, the Lead Firing Site. The western boundary of site 91 is about 100 feet east of ER site 6. Both site 91 and 6 are posted according to SNL/NM signing and posting procedures and are highly visible to persons entering the area. Any corrective measures construction activities that could potentially pose a hazard to the public and/or workers in the area who are not involved in the ER program shall be subject to access restriction; only authorized personnel shall be allowed access into the pre-determined exclusion zone for safe work operations. In addition, coordination with all other organizations conducting activities adjacent to the proposed activity shall be closely maintained.

An approved Project Health and Safety Plan (HASP) will be in place prior to any field work, and all workers will have current OSHA- and SNL-required training. A site-specific briefing by the SNL ER Task Leader or Assistant Task Leader will be conducted with the field crew prior to initiating work at a site. Workers will wear proper protective clothing (Level B), or downgrade as appropriate during all field activities. Monitoring equipment will be used to detect the presence of hazardous chemicals or radiation at the site. Contractors have experience in the kind of work being performed and will follow guidelines in the HASP to ensure that only proper and safe actions are undertaken at the sites.

Waste management and storage practices will conform to all SNL/NM guidelines, Federal regulations and State regulations. Contaminated materials will be segregated on site in order to minimize contaminated volumes. DOT regulations will be followed for the packaging and transport of wastes. Only permitted TSD facilities will be utilized for waste disposal.

During the course of the VCM activities, proper precautions will be taken to prevent significant release of hazardous constituents. Soil berms lined with plastic sheeting will separate excavated, contaminated soils from clean soil material. Contaminated materials will be segregated on site and placed into appropriate closed-top containers to avoid spread of contamination. Decontamination procedures for equipment and monitoring of site workers will prevent inadvertent transport of materials off-site.

### **5.3b Relationship of the VCM to the Attainment of the Final Remedy**

The purpose of this VCM is to investigate and excavate the contents of the gas cylinder pit, ER site 6, in order to ascertain its hazardous or non-hazardous nature. The gaseous nature and small volumes of the contents of any gas cylinders makes it quite unlikely that surrounding soils would have been contaminated during the short time they might have been in the pit. The proposed VCM in essence accomplishes site characterization and remediation concurrently, since the entire contents of the pit will be examined, and the underlying soils characterized. No further remediation is anticipated to be required.